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(Report On The Vegetation of
The Herring River System
Cape Cod National Seashore
Wellfleet, Massachusetts)

September 26, 1981

QX F1-10

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Introduction

Several paradoxes are presented to humans when they come into contact with coastal ecosystems. While these systems are highly productive and resilient in an environment characterized by high salinity, tidal fluctuations, and frequent storms, coastal ecosystems are quite fragile when subjected to anthropogenic disturbances such as inlet stabilization, water level manipulation, and the use of wheeled vehicles. The maintenance of coastal ecosystems, especially salt marshes and sand dunes, appears to depend on the preservation of the dynamic interplay between biological communities and fluctuating physical environments (Art, 1976).

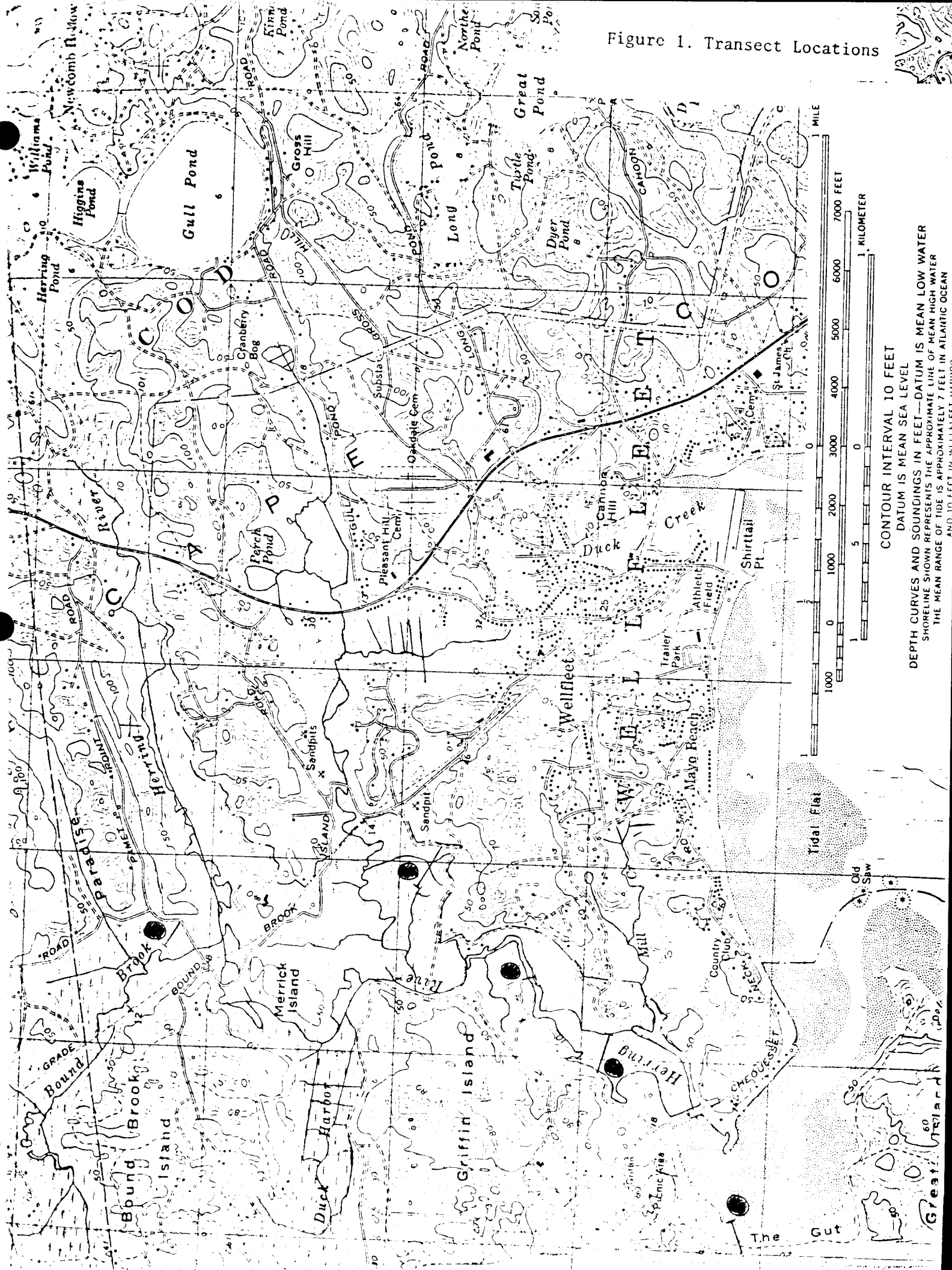
This pilot study is the initiation of a long-term examination of changes in the biological communities adjacent to the Herring River, Wellfleet, Ma. The establishment of causal relationships involved in the changes in species dominance and composition is to some extent problematic. However, it is clear that dramatic changes have occurred over the past Century and may well continue into the future. As further vegetational data is collected and historical evidence is discovered, a more complete view of the alterations of the Herring River watershed and their causes should emerge.

Methods

The portion of the Herring River examined in this study is located approximately $41^{\circ}57'N$, $70^{\circ}2'30''W$ in the town of Wellfleet, Massachusetts. The area is located in the west-central portion of the "Wellfleet, Mass." quadrangle of the 7 $\frac{1}{2}$ minute series U.S.G.S. Topographic Map (Figure 1.).

The field data was collected in the Herring River watershed on Saturday, September 26, 1981 between 12:30 and 5:00pm. The weather was warm ($20^{\circ}C$) and sunny. Transects were chosen to represent a series of sites of varying

Figure 1. Transect Locations



distances upstream along the Herring River and its tributaries (Figure 1.). Where possible the transects started at obvious landmarks near a road, were oriented at right angles to the river systems, and ran toward landmarks visible on a distant horizon. The transects were photographed from their starting points to both aid in their relocation in the future and to record a photographic image of the community at the time of data collection (Figs. 2-11). (See transect descriptions in the following section).

Data was collected along the transect by the line intersect method. The coverage of each species, bare ground, roads, ditches, and creeks was noted along the transect at 0.1 m intervals (Tables 1-5, Figs. 12-16.).

The dominance of each species along the transect was expressed by calculating its adjusted linear distance (Σ (interval distance $\times$ cover)) and relative cover ((species adjusted linear distance / Total linear distance) $\times$ 100) See Tables 6-10.

Transect Descriptions

TRANSECT A.

Transect A is located in the Bound Brook drainage on the north side of Pamet Point Road halfway between its intersections with County Road and Bound Brook Island Road. The transect starts at a telephone pole on the south-east side of Pamet Point Road where the road forms a bend. From the pole, the transect runs 318° magnetic (302° True) toward the chimney of a white, broad-sided house (to the left of another house visible on the horizon). The distance analyzed was 150 m. A small, dry, muddy ditch was found at 165m. The transect is located approximately 4500 m upstream from the Herring River Dike.

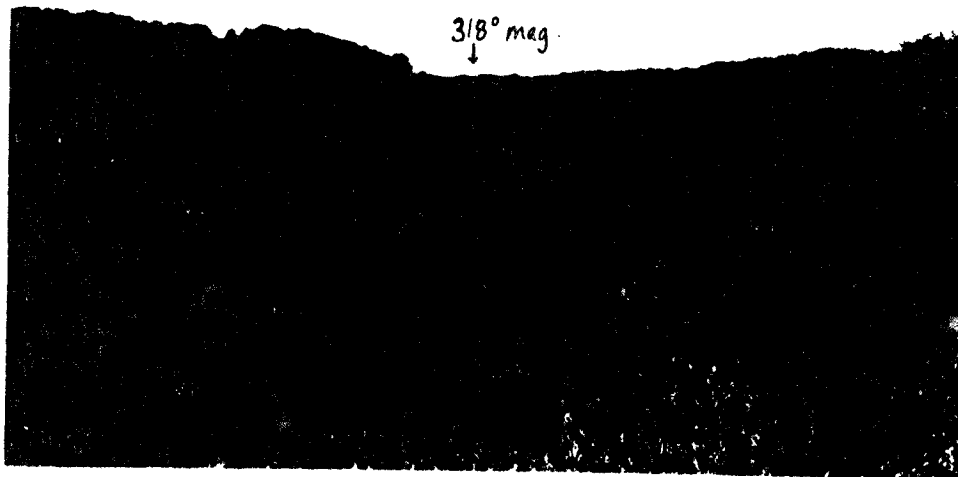


Figure 2. Transect A. View from Pamet Point Road.

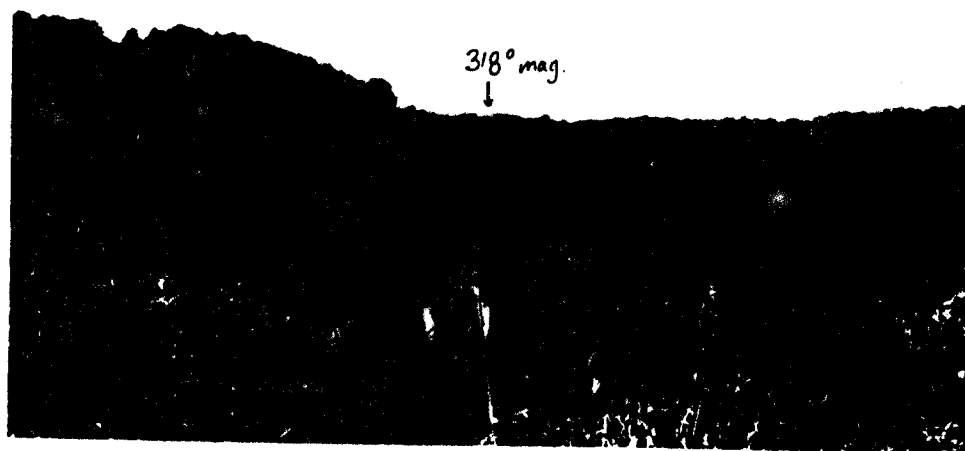


Figure 3. Transect A. View from approximately 10m. A Viburnum and Typha thicket.

TRANSECT B.

Transect B is located in the Herring River drainage "Lane Meadow" area off a dirt road running from the sandpits to the High Toss Bridge. The transect starts at a concrete USDI-NPS monument 26-52 (approximately 100 m north of the intersection with a sand jeep trail) and runs 317° magnetic (301° True) toward the notch between Merrick Island and Bound Brook Island visible on the WNW horizon. Transect B runs for 250 m crossing ditches at 69.1m, 101.6 m, and 150 m. The transect is approximately 3000 m upstream from the Herring River Dike.



Figure 4. Transect B. General view. Dominant species in mid-ground is Lactuca canadensis.



Figure 5. Transect B. Horizon landmark.

Bnd. Brk. Is. Merrick Is.
Griffin Is.

TRANSECT C.

Transect C is located on the east side of Griffin Island, off the jeep road which runs to the east toward the Herring River. The transect starts at the bend in the sand road at the base of a tree covered dune, a point where a large pine of the ridge on the eastern side of Herring River is 183° magnetic (167° True), a small chimney on the house on the ridge top is 148° magnetic (132° True), and the large chimney (brown and broad) is 176.5° magnetic (160.5° True). The transect runs 183° magnetic (toward the pine tree) 74 m to the edge of the Herring River. The transect is approximately 1200 m upstream from the Herring River Dike.

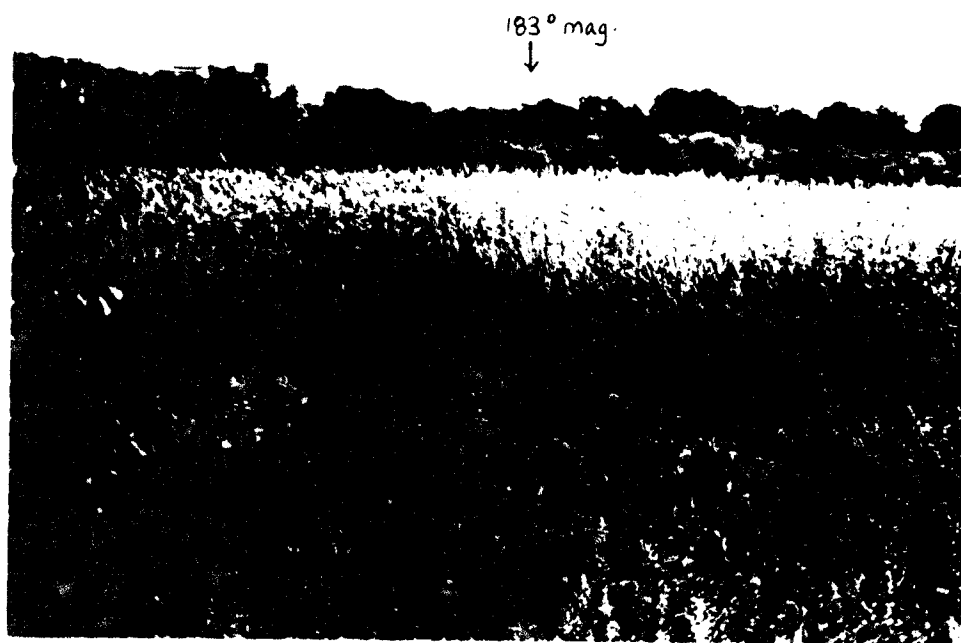


Figure 6. Transect C, a general view Solidago in the foreground, then Typha and Phragmites zones in the middle distance.

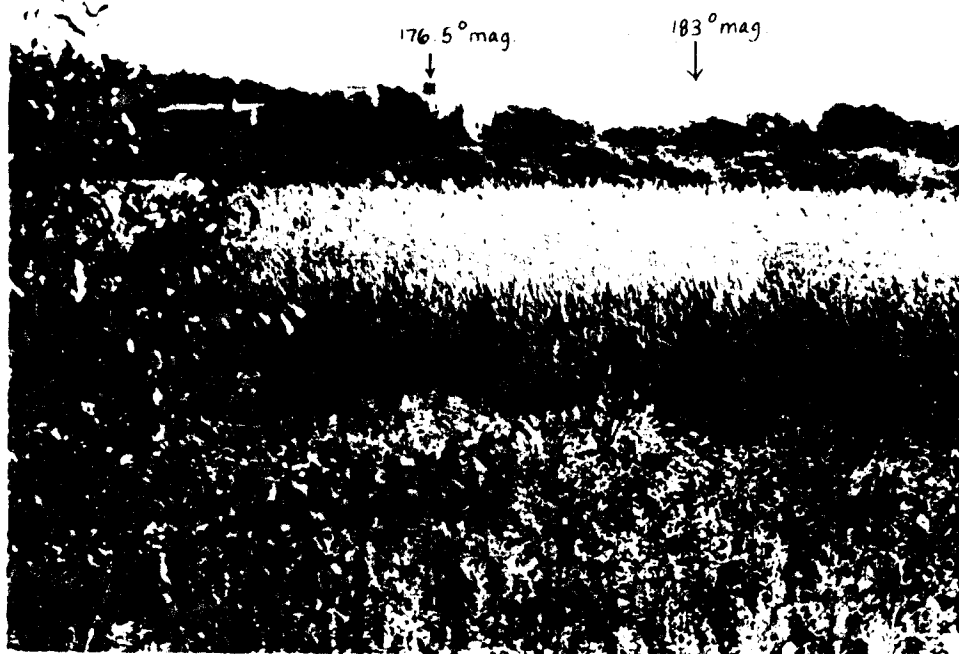


Figure 7. Transect C. Broad Brown chimney at 176.5° magnetic

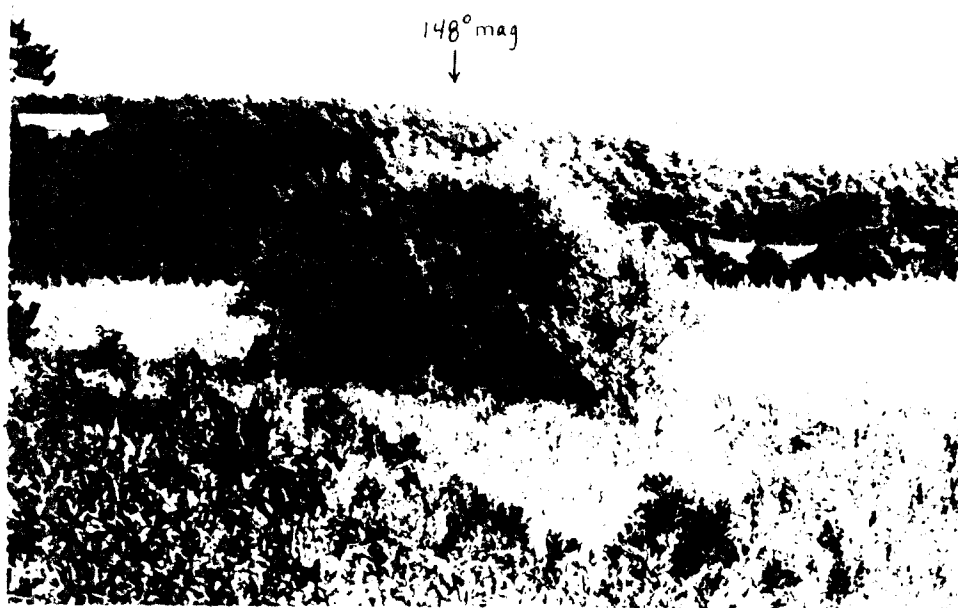


Figure 8. Transect C. Small chimney at 148° magnetic.

TRANSECT D.

Transect D is located 65 m north of the one-way loops on the road running along the east side of Griffin Island. The transect starts at the center of the road and runs through the base of a large Pinus rigida 123° magnetic (107° True) toward a sandy opening on the highest point on the ridge on the east side of Herring River. The transect runs 103.6 m from the road to the western edge of the Herring River and is approximately 500 m upstream from the Herring River Dike.



Figure 9. Transect D. Quaking aspen (Populus tremuloides) in the foreground, Phragmites in the middle distance and the bare spot landmark is visible in the distance.

TRANSECT E.

Transect E is located on The Gut linking Great Island to Griffin Island. The transect starts at the eastern end of a line of large rocks placed at the southern end of the parking area on The Gut and runs toward the middle gate of the Herring River Dike, 84° magnetic (68° True) 220.5 m where it meets Wellfleet Harbor. The transect is approximately 700 m downstream from the Herring River Dike.

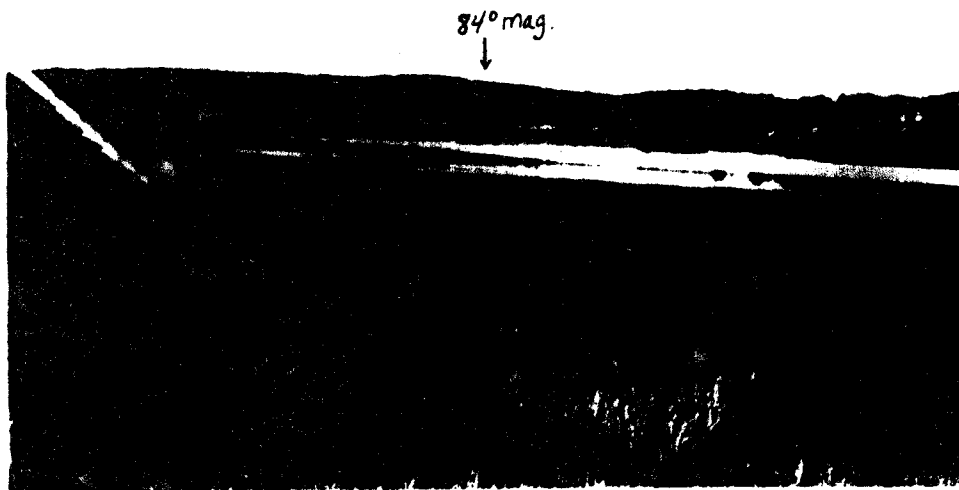


Figure 10. Transect E. General view showing Ammophila in the foreground, dense mats of Spartina patens in the middle distance, and tall, golden stands of Spartina alterniflora at the margin of Wellfleet Harbor in the distance.



Figure 11. Transect E. Closer view of transect showing middle gate of Herring River Dike in the distance.

Results

Transect A. (Tables 1&6, Figures 2,3,&12) The transect starts in a sandy area covered sparsely by grasses, then crosses Pamet Point Road and enters a dense stand of blackberry (Rubus allegheniensis). The first 50 m of the transect are characterized by a mosaic of old field species such as Spirea, Polygonum, and Solidago interspersed among stands of freshwater wetland Typha latifolia. The next 50 m are similar with the addition of clumps of nannyberry (Viburnum lentago). The last 50 m are similar to the first except for the reduction in Spirea abundance and the increase in Solidago tenuifolia.

The entire area appears to be a fresh water wetland which is drying out as indicated by the abundance of woody shrubs. The ground surface appears to be relatively dry and level. The only topographic irregularities are

hummocks of Scirpus cyperinus at 85 - 95 m. Phragmites communis has patches of local dominance in the area, although none was encountered on the transect.

Transect B. (Tables 2 & 7, Figures 4,5, & 13) The Lane Meadow area appears to be drier than the Bound Brook area covered by Transect A. Old field species such as Solidago puberula, S. tenuifolia, Lactuca canadensis, Holcus lanatus and Rubus allegheniensis dominate this community. Typha and Phragmites both indicators of wet substrates are absent from the community although Scirpus cyperinus is present in the interval 95 - 165 m.

Transect C. (Tables 3 & 8, Figures 6,7,8, & 14) The transect starts in an area dominated by beach grass (Ammophila breviligulata) and Solidago nemoralis, but by 20 m, fresh water wetland species (Typha latifolia, Juncus sp. and Phragmites communis start to dominate and continue to do so to the edge of the Herring River.

Transect D. (Tables 4 & 9, Figures 9 & 15). Transect D has a pattern typical of a transition from upland coastal woodland to salt marsh. The first 16 m are a mosaic of grasses interspersed with pitch pine and small quaking aspen (Populus tremuloides). From 16 to 22 m there is a shrub zone dominated by Rhus radicans and Myrica pensylvanica and then a zone dominated by Phragmites communis (22 - 36 m). Beyond the Phragmites the transect crosses a typical salt marsh transition zonation (Art, 1976) of Scirpus americanus (36-40m) then Spartina patens (39-43m) and finally Spartina alterniflora (40+m) to the margin of the Herring River.

Transect E. (Tables 5 & 10, Figures 10, 11, & 16). Transect E begins

at the crest of the primary dune on The Gut in a typical beach grass (Ammophila breviligulata) community. Ammophila dominates the west side of the sand road (40m). On the east side of the road there is a broad meadow of salt marsh hay (Spartina patens) with some local dominance of S. alterniflora. Beyond 125 m, the salt marsh is dominated by Spartina alterniflora to the margin of the Wellfleet Harbor.

Discussion

From one year's data it is difficult to establish with certainty the exact changes in the vegetation caused by human manipulations of the Herring River watershed. However, it is clear that Transects A, B, and C are all dominated by non-halophytic species. These transects, located 4500 to 1200 m up river from the Herring River Dike, in many locations are dominated by old-field, weedy species such as Solidago spp., Polygonum spp., Holcus lanatus, and Lactuca canadensis. In other areas crossed by these transects, Phragmites communis, Scirpus cyperinus, and Typha latifolia dominate, especially if soil moisture is abundant or if creeks or rivers are near. The latter two species are indicators of fresh-water wetlands of relatively low salinity (Hinds & Hathaway, 1968).

The only transects to intersect halophytic vegetation were Transects D and E. Transect E, ending in Wellfleet Harbor, is obviously less affected by the Herring River Dike and upstream mosquito ditching. Transect D, only 500 m upstream from the dike, probably owes its presence of Spartina spp. and Scirpus americanus to saline waters passing from Wellfleet Harbor into the Herring River through the gates in the dike.

It is obvious that the present vegetation in the Herring River drainage

has undergone compositional change and is dramatically different from that prior to the construction of the Herring River Dike in 1908-1909 and subsequent drainage projects. E.G. Rich (1970a,b & 1971) gives accounts of the Herring River prior to the construction of the tidal gate and flood control structures at its mouth. Rich (1970a) noted that 6 to 8 feet of water covered the Herring River marshes at high tide and that vessels sailed up the river to Bound Brook and Griffins Islands, "I can remember well the phenomenon of seeing such a vast expanse of clear blue water lapping at the shoreline of Griffins Island, Merricks and Bound Brook Islands as far as the South Truro line."

Prior to the installation of tidal gates, herring ran up the Herring River to Gull Pond and the Town of Wellfleet sold fishing rights to individuals who packed their catches at the fish house on Bound Brook Island (Rich, 1971). Evidently the railroad embankment had little effect on the herring run since the crates of fish were shipped out of the watershed by rail. The photograph accompanying Rich's article shows a broad expanse of salt marsh dominated by Spartina patens and S. alterniflora in the vicinity of Transect A.

The Herring River Dike and tidal gates were not the only alterations of the river system in the early 20th Century. According to Rich (1971), the Town of Wellfleet voted to appropriate funds for drainage ditches in the Herring River marshes each year between 1910 and 1914. The intent was to both reduce the mosquito populations and to provide for new farm land (Rich, 1970).

Relatively little additional ditching appears to have been done into the early 1930's according to the map accompanying the "Report on Conditions above Wellfleet Dike", dated March 7, 1932 and commissioned by the Commonwealth of Massachusetts Harbor and Land Commission Office (Figure 17.). In fact, the map shows a group of islands (Hopkins Islands) east of Griffin Island surrounded by the Herring River and an inlet from Duck Harbor to Cape Cod Bay. While the Herring River is indicated as having a dredged channel west of

Merrick Island, the river has a much wider channel below the High Toss Bridge than at present.

By 1941, most of the present ditching of the Herring River, Duck Harbor, Bound Brook and Mill Creek marshes was in place as is shown on the U.S.G.S. 1944 edition of the 7½ minute Wellfleet, Mass. Topographic map (Figure 18). The only changes between the 1941 map and the maps prepared by the Cape Cod Mosquito Control Project in 1962 are the abandonment of the railroad, the further dredging of existing ditches and channels, and the areas marked "spill" (spoil?) on the edges of dredged water courses (Figures 19 & 20).

CONCLUSIONS

The Herring River system has been highly modified by the human modification of the natural balances between the flows of fresh and saline waters. While the detail represented in this preliminary report is not sufficient to establish causal relationships, it is highly likely that the combination of restricting tidal influxes of salt-water and enhancing the run-off of fresh-water through the extensively ditched and dredged marsh-creek system has led to both a reduction in the salt marsh vegetation and a conversion of fresh-water wetland vegetation to communities dominated by old-field species.

Figure 12. Transect A. Species Intercept Cover (11/26/81)

46 1521

K-E 10 X 10 TO THE CENTIMETER 18 X 25 CM
KEUFFEL & ESSER CO. MADE IN U.S.A.

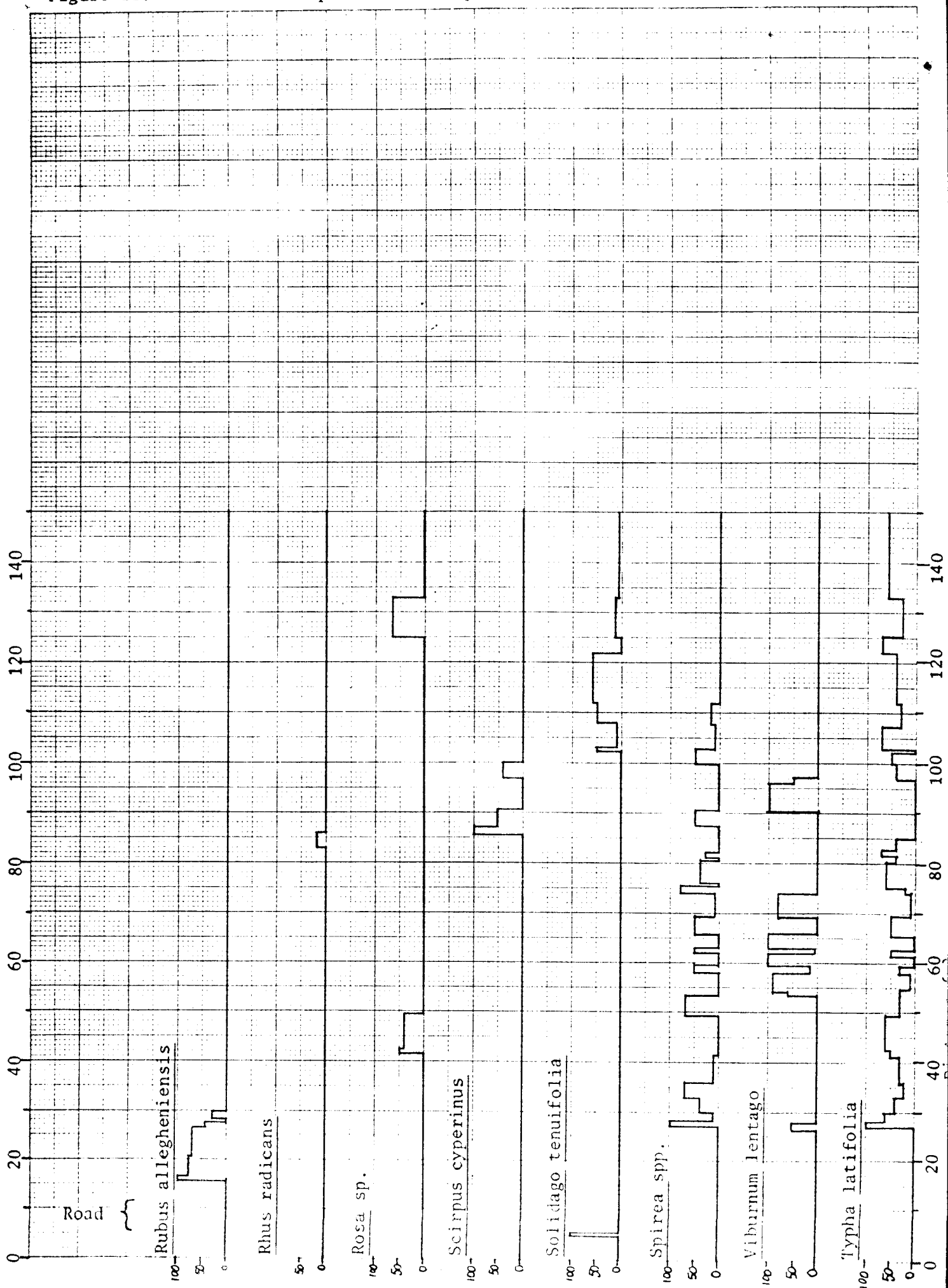


Figure 13. Transect B. Species Intercept Cover (11/26/81)

46 1521

1:12 10 X 10 TO THE CENTIMETER 15 X 25 CM
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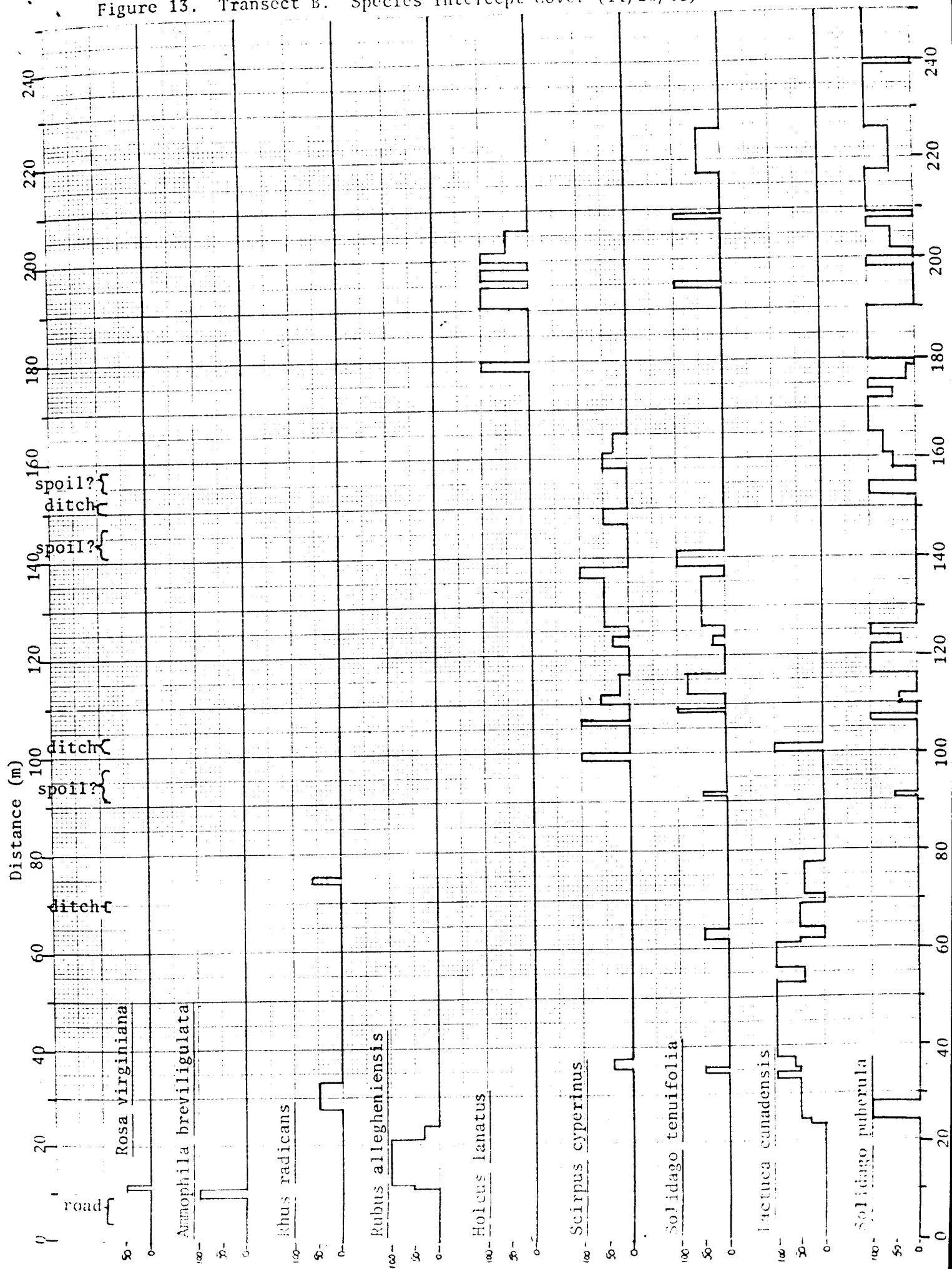


Figure 14. Transect C. Species Intercept Cover (11/26/81)

46 1521

10 X 10 TO THE CENTIMETER 18 X 25 CM
PULFEL & ESCHER CO. MADE IN U.S.A.

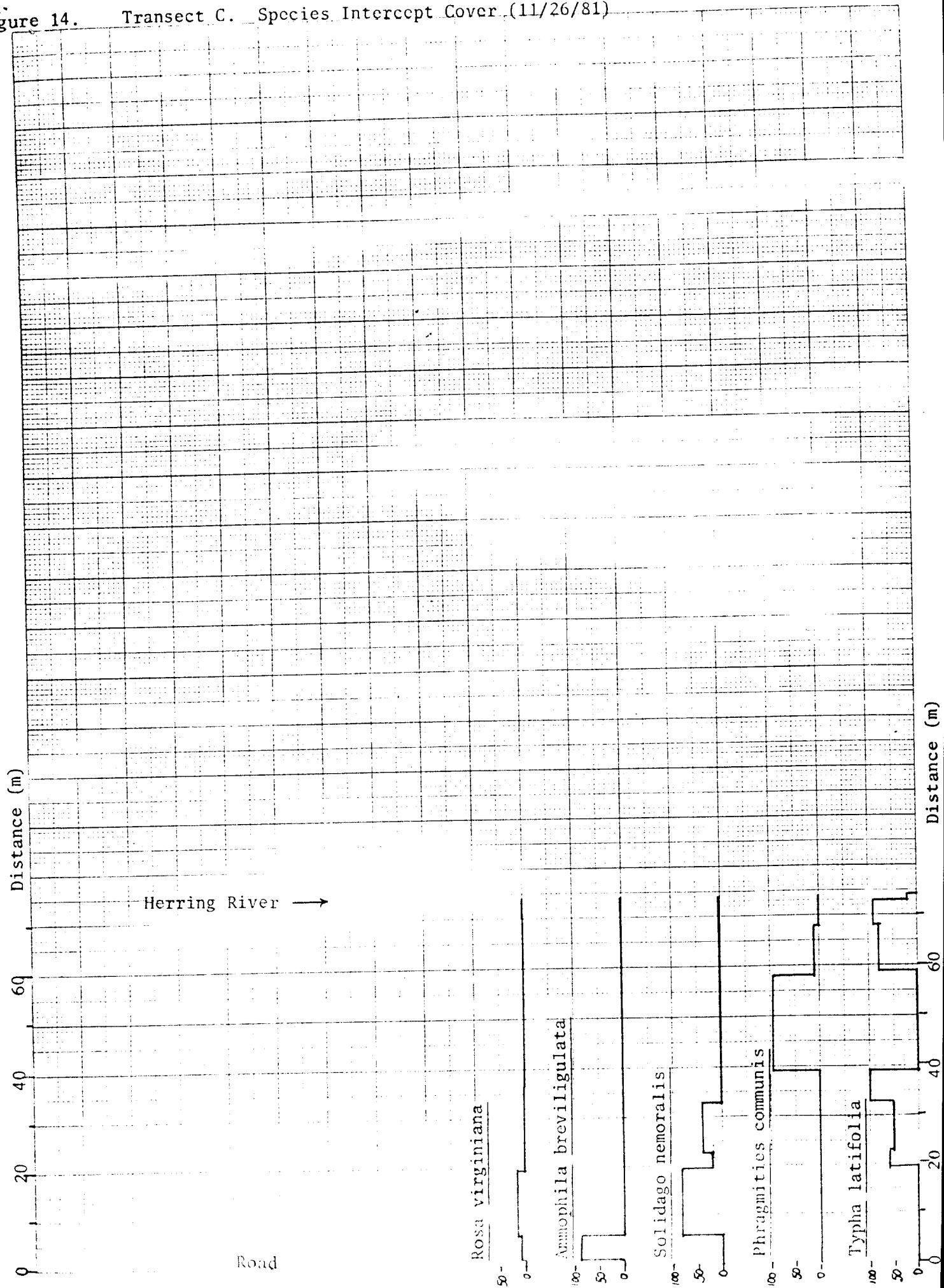


Figure 15. Transect D. Species Intercept Cover (11/26/81)

46 1521

K&E 10 X 10 TO THE CENTIMETER 18 X 25 CM
KEUFFEL & ESSER CO. MADE IN U.S.A.

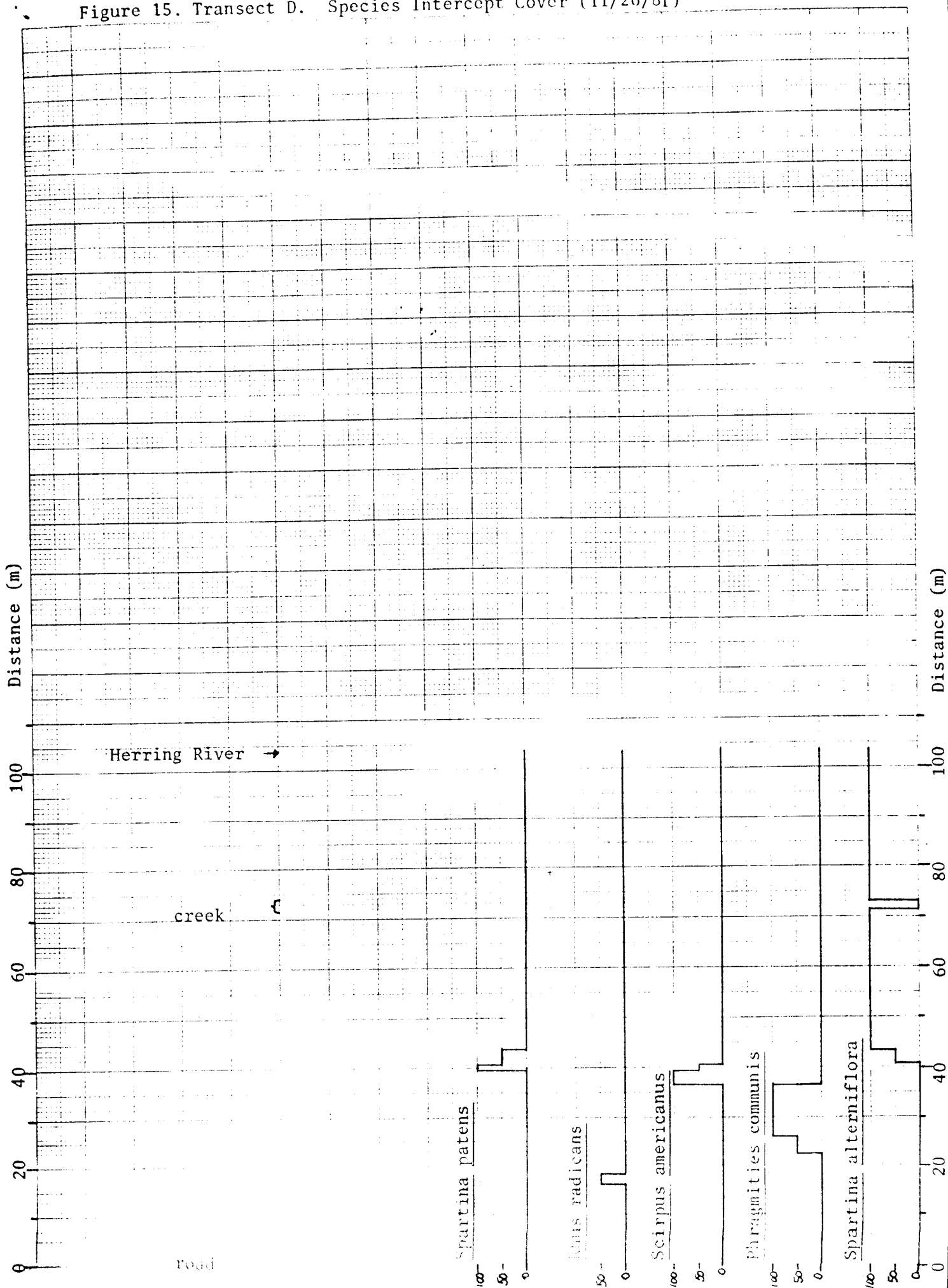
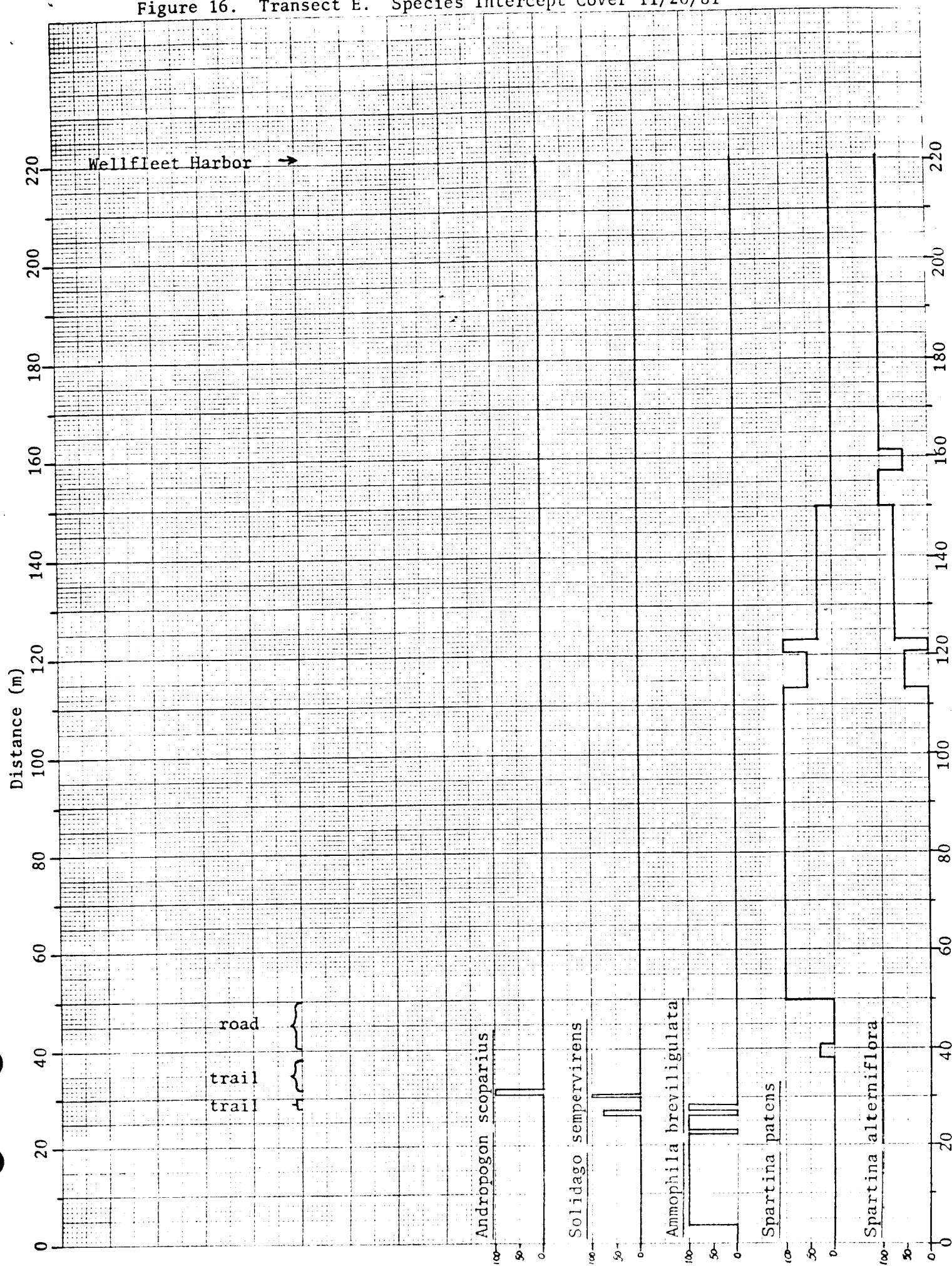


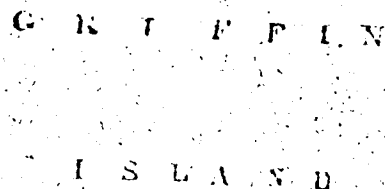
Figure 16. Transect E. Species Intercept Cover 11/26/81

46 1521

K&E 10 X 10 TO THE CENTIMETER 18 X 25 CM
KEUFFEL & ESSER CO. MADE IN U.S.A.



NOVEMBER 1900



Inventaire de Pape
unecore - 200
Damascore 44
S.O. Cor. 1. Pape

B.M. - 5. 13.26. A cluster of nests in top of
wren in ivy wall at extreme end.
Base of 12.11 = E. 14.74.

High Toss Bridge

upstream ES. 15.5

Steve Jones

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For more information, visit the website at
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Figure 18. 1944 U.S.G.S.

Wellfleet, Mass Quadrangle

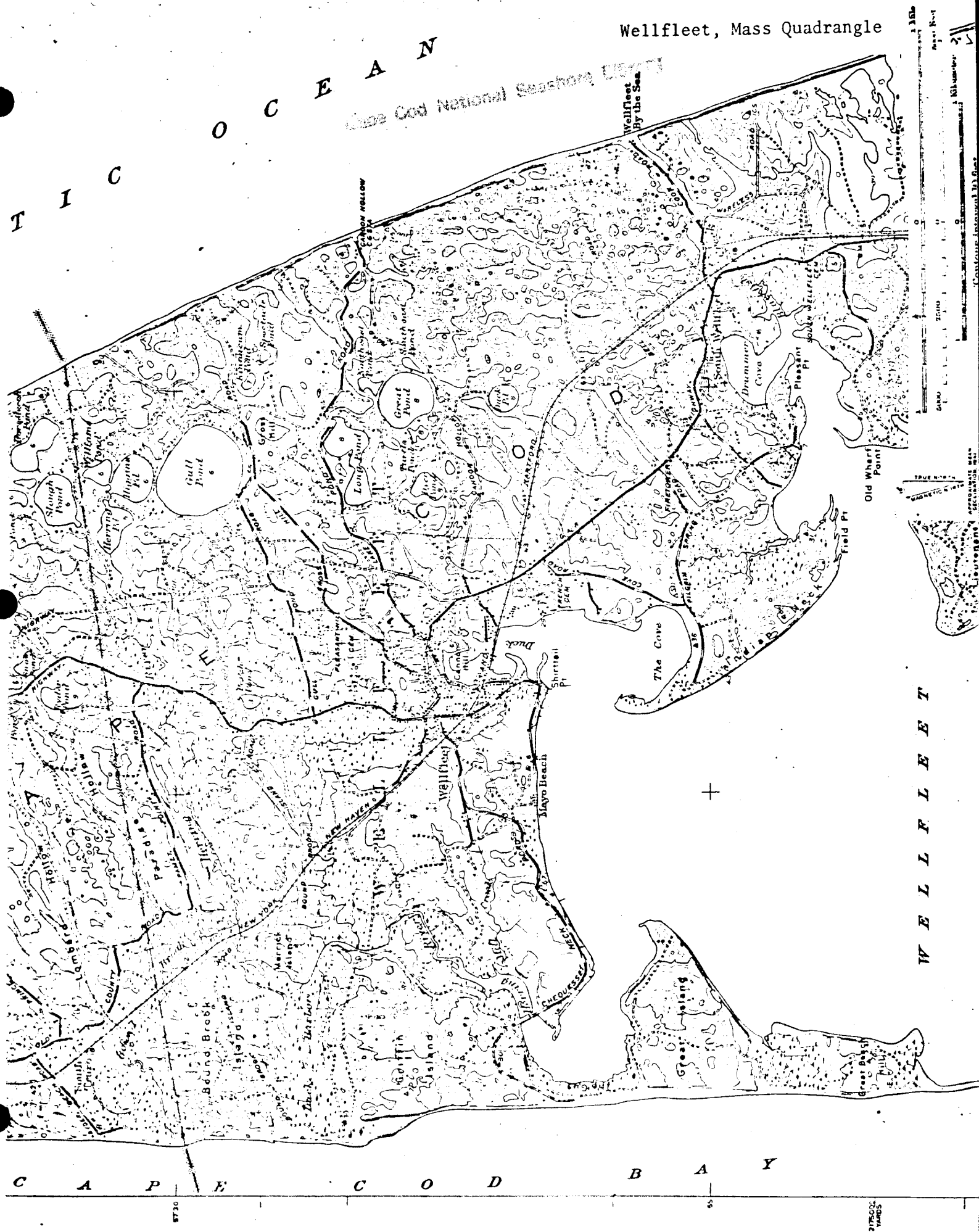
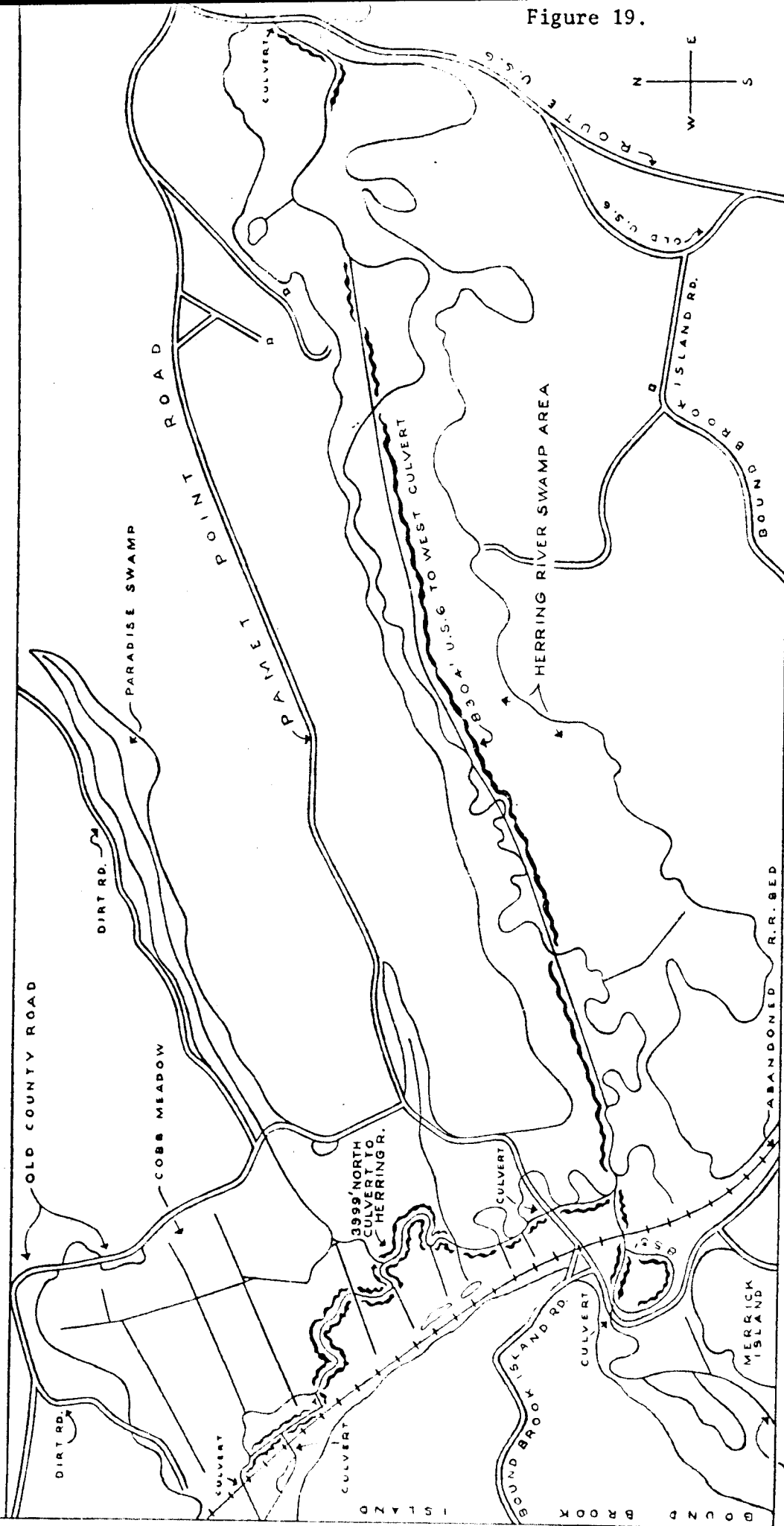


Figure 19.

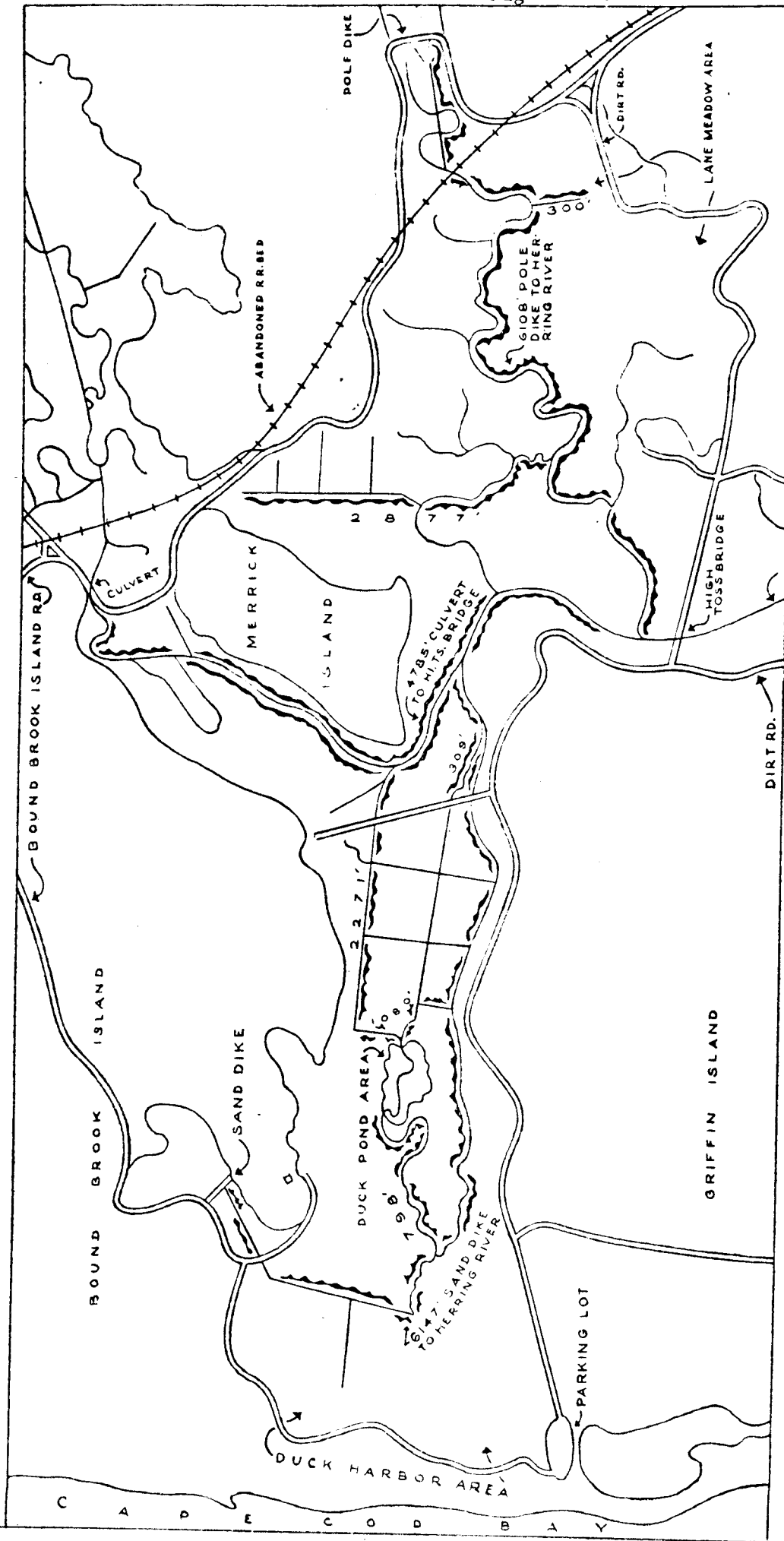


HERRING RIVER AND ITS BRANCHES ALL WATER DRAINS SOUTH INTO WELFLEET HARBOR

MAP OF HERRING RIVER COMPLEX WELFLEET

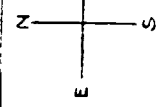
S Y M B O L S
 - - - - - INDICATES SPILL
 ALL FIGURES ARE IN
 APPROXIMATE FOOT
 MEASUREMENT

Figure 20.



MAP OF HERRING RIVER COMPLEX WELLFLEET

S Y M B O L S
 - INDICATES SPILL
 ALL FIGURES ARE IN
 APPROXIMATE FOOT
 MEASUREMENT



ALL WATER DRAINS THROUGH HIGH TOSS BRIDGE
 SOUTH AND EMPTIES INTO WELLFLEET HARBOR
 HERRING RIVER AND ITS BRANCHES

FUTURE PLANS

1. Resurvey and monitor present Transects A-E.
2. Develop elevational profiles of each transect.
3. Establish new transects between Transects B & C and C & D.
4. Establish the upriver extent of various halophytic species.
5. Make salinity and conductivity measurements along transects.
6. Elaborate on the historical aspects of vegetational changes in the
Herring River system by obtaining aerial photographs, ground
level photographs, and old maps.

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ACKNOWLEDGEMENTS

The helpful assistance of Michael Soukup and John Portnoy of the National Park Service and Oscar Doane of the Cape Cod Mosquito Control Project is greatly appreciated.

Table 1 Transect A : Species Intercept Cover (9/26/81)

From meter to meter:	Species:	% Cover:	% Bare Ground:
0.0 0.8	Bare Ground		100
0.8 0.9	<u>Polygonella articulata</u>	100	
0.9 3.0	Bare Ground		100
3.0 3.5	<u>Digitaria sanguinalis</u>	100	
3.5 4.4	Bare Ground		100
4.4 4.5	Graminae, sp.	100	
4.5 4.7	<u>Lechea maritima</u>	30	
4.7 5.0	Bare Ground		100
5.0 5.1	<u>Solidago tenuifolia</u>	100	
5.1 5.2	Bare Ground		100
5.2 5.3	<u>Digitaria sanguinalis</u>	100	
5.3 5.5	Bare Ground		100
5.5 11.6	Asphalt Road		100
11.6 11.7	Bare Ground		100
11.7 12.9	<u>Rubus hispidus</u>	25	
11.7 12.9	<u>Panicum, sp.</u>	75	
12.9 15.4	<u>Rubus hispidus</u>	95	
12.9 15.4	Bare Ground		5
15.4 15.8	<u>Panicum, sp.</u>	100	
15.8 16.2	<u>Rubus allegheniensis</u>	100	
16.2 20.7	<u>Rubus allegheniensis</u>	75	
16.2 20.7	<u>Solidago nemoralis</u>	25	
20.7 23.4	<u>Rubus allegheniensis</u>	70	
20.7 23.4	<u>Polygonum scandens</u>	25	
20.7 23.4	<u>Impatiens capensis</u>	5	
23.4 26.5	<u>Rubus allegheniensis</u>	70	
23.4 26.5	<u>Solidago nemoralis</u>	15	
23.4 26.5	<u>Polygonum pennsylvanicum</u>	15	
26.5 27.4	<u>Rubus allegheniensis</u>	40	
26.5 27.4	<u>Viburnum lentago</u>	50	
26.5 27.4	<u>Polygonum scandens</u>	10	
27.4 27.9	<u>Spirea tomentosa</u>	50	
27.4 27.9	<u>Spirea latifolia</u>	50	
27.9 28.1	<u>Typha latifolia</u>	100	
28.1 30.0	<u>Typha latifolia</u>	60	
28.1 30.0	<u>Spirea latifolia</u>	10	
28.1 30.0	<u>Rubus allegheniensis</u>	30	
30.0 33.3	<u>Polygonum scandens</u>	20	
30.0 33.3	<u>Typha latifolia</u>	40	
30.0 33.3	<u>Spirea latifolia</u>	40	
33.0 36.0	<u>Spirea latifolia</u>	70	
33.3 36.0	<u>Typha latifolia</u>	25	
33.3 36.0	<u>Thelypteris palustris</u>	5	
36.0 41.6	<u>Thelypteris palustris</u>	10	
36.0 41.6	<u>Spirea tomentosa</u>	7	
36.0 41.6	<u>Typha latifolia</u>	30	
36.0 41.6	<u>Polygonum pennsylvanicum</u>	25	
36.0 41.6	<u>Polygonum scandens</u>	25	
36.0 41.6	<u>Solidago nemoralis</u>	3	
41.6 42.3	<u>Typha latifolia</u>	50	

Table 1 (cont) Transect A : Species Intercept Cover (9/26/81)

From meter to meter:		Species:	% Cover:	% Bare Ground:
41.6	42.3	<u>Rosa virginiana</u>	50	
42.3	49.5	<u>Rosa virginiana</u>	40	
42.3	49.5	<u>Typha latifolia</u>	60	
49.5	53.5	<u>Typha latifolia</u>	30	
49.5	53.5	<u>Spirea latifolia</u>	70	
53.5	54.3	<u>Viburnum lentago</u>	60	
53.5	54.3	<u>Typha latifolia</u>	30	
53.5	54.3	<u>Solidago nemoralis</u>	5	
53.5	54.3	<u>Dryopteris spinulosa</u>	5	
54.3	58.0	<u>Typha latifolia</u>	10	
54.3	58.0	<u>Viburnum lentago</u>	90	
58.0	59.5	<u>Viburnum lentago</u>	15	
58.0	59.5	<u>Typha latifolia</u>	35	
58.0	59.5	<u>Spirea latifolia</u>	50	
59.5	61.8	<u>Viburnum lentago</u>	100	
61.8	62.8	<u>Typha latifolia</u>	50	
61.8	62.8	<u>Spirea latifolia</u>	50	
62.3	65.4	<u>Viburnum lentago</u>	100	
65.4	69.5	<u>Spirea latifolia</u>	50	
65.4	69.5	<u>Typha latifolia</u>	50	
69.5	73.7	<u>Typha latifolia</u>	10	
69.5	73.7	<u>Spirea latifolia</u>	10	
69.5	73.7	<u>Viburnum lentago</u>	80	
73.7	75.1	<u>Spirea latifolia</u>	80	
73.7	75.1	<u>Typha latifolia</u>	20	
75.1	75.3	<u>Sphagnum, sp.</u>	100	
75.3	80.5	<u>Spirea latifolia</u>	40	
75.3	80.5	<u>Typha latifolia</u>	60	
80.5	81.2	<u>Typha latifolia</u>	40	
80.5	81.2	<u>Sphagnum, sp.</u>	50	
80.5	81.2	<u>Dryopteris spinulosa</u>	10	
81.2	82.7	<u>Typha latifolia</u>	70	
81.2	82.7	<u>Spirea latifolia</u>	30	
82.7	85.4	<u>Typha latifolia</u>	40	
82.7	85.4	<u>Lythrum, sp.</u>	40	
82.7	85.4	<u>Rhus radicans</u>	20	
85.4	87.3	<u>Scirpus cyperinus</u>	100	
87.3	90.4	<u>Scirpus cyperinus</u>	50	
87.3	90.4	<u>Spirea latifolia</u>	50	
90.4	96.0	<u>Viburnum lentago</u>	100	
96.0	97.0	<u>Viburnum lentago</u>	50	
96.0	97.0	<u>Polygonum scandens</u>	50	
97.0	100.0	<u>Polygonum pennsylvanicum</u>	20	
97.0	100.0	<u>Typha latifolia</u>	40	
97.0	100.0	<u>Scirpus cyperinus</u>	40	
100.0	102.5	<u>Spirea latifolia</u>	50	
100.0	102.5	<u>Typha latifolia</u>	50	
102.5	102.7	<u>Solidago tenuifolia</u>	50	
102.5	102.7	<u>Spirea latifolia</u>	50	

Table 1 (cont) Transect A : Species Intercept Cover (9/26/81)

From meter to meter:	Species:	% Cover:	% Bare Ground:
102.7 108.3	<u>Spirea latifolia</u>	10	
102.7 108.3	<u>Lactuca canadensis</u>	10	
102.7 108.3	<u>Solidago tenuifolia</u>	10	
102.7 108.3	<u>Typha latifolia</u>	70	
108.3 111.8	<u>Typha latifolia</u>	30	
108.3 111.8	<u>Spirea latifolia</u>	20	
108.3 111.8	<u>Solidago tenuifolia</u>	50	
111.8 121.8	<u>Solidago tenuifolia</u>	60	
111.8 12.8	<u>Typha latifolia</u>	40	
121.8 125.1	<u>Typha latifolia</u>	70	
121.8 125.1	<u>Aster novi-belgii</u>	10	
121.8 125.1	<u>Rosa virginiana</u>	10	
121.8 125.1	<u>Polygonum pennsylvanicum</u>	10	
125.1 132.9	<u>Typha latifolia</u>	25	
125.1 132.9	<u>Solidago tenuifolia</u>	10	
125.1 132.9	<u>Rosa virginiana</u>	65	
132.9 150.0	<u>Typha latifolia</u>	60	
132.9 150.0	<u>Aster novi-belgii</u>	5	
132.9 150.0	<u>Lactuca canadensis</u>	5	
132.9 150.0	<u>Solidago tenuifolia</u>	5	
132.9 150.0	<u>Thelypteris palustris</u>	5	
132.9 150.0	<u>Dryopteris spinulosa</u>	10	
132.9 150.0	<u>Solidago nemoralis</u>	10	

Table 2: Transect B : Species Intercept Cover (9/26/81)

From meter to meter:	Species:	% Cover:	% Bare Ground:
0.0 3.7	<u>Myrica pennsylvanica</u>	50	
0.0 3.7	<u>Gaylussacia baccata</u>	50	
3.7 9.3	Bare Ground (Road)		100
9.3 11.0	<u>Ammophila breviligulata</u>	100	
11.0 11.7	<u>Rosa virginiana</u>	50	
11.0 11.7	<u>Rubus allegheniensis</u>	50	
11.7 21.0	<u>Rubus allegheniensis</u>	100	
21.0 23.3	<u>Rubus allegheniensis</u>	30	
21.0 23.3	<u>Solidago puberula</u>	70	
23.3 24.3	<u>Lactuca canadensis</u>	30	
23.3 24.3	Bare Ground		70
24.3 28.5	<u>Solidago puberula</u>	50	
24.3 28.5	<u>Lactuca canadensis</u>	50	
28.5 33.1	<u>Rhus radicans</u>	50	
28.5 33.1	<u>Lactuca canadensis</u>	50	
33.1 34.5	<u>Lactuca canadensis</u>	100	
34.5 35.3	<u>Solidago tenunifolia</u>	50	
34.5 35.3	<u>Lactuca canadensis</u>	50	
35.3 37.5	<u>Scirpus cyperinus</u>	40	
35.3 37.5	<u>Lactuca canadensis</u>	60	
37.5 53.0	<u>Lactuca canadensis</u>	100	
53.0 56.2	<u>Rubus hispidus</u>	60	
53.0 56.2	<u>Lactuca canadensis</u>	40	
56.2 61.3	<u>Lactuca canadensis</u>	100	
61.3 62.1	<u>Spirea tomentosa</u>	50	
61.3 62.1	<u>Lactuca canadensis</u>	50	
62.1 64.3	<u>Spirea tomentosa</u>	50	
62.1 64.3	<u>Solidago tenunifolia</u>	50	
64.3 69.1	Bare Ground		50
64.3 69.1	<u>Lactuca canadensis</u>	50	
69.1 70.9	H ₂ O (channel)		100
70.9 74.2	<u>Spirea tomentosa</u>	60	
70.9 74.2	<u>Lactuca canadensis</u>	40	
74.2 75.2	<u>Rhus radicans</u>	60	
74.2 75.2	<u>Lactuca canadensis</u>	40	
75.2 77.5	<u>Spirea tomentosa</u>	50	
75.2 77.5	<u>Lactuca canadensis</u>	50	
77.5 83.2	<u>Spirea latifolia</u>	70	
77.5 83.2	<u>Spirea tomentosa</u>	30	
83.2 88.7	<u>Spirea tomentosa</u>	40	
83.2 88.7	<u>Polygonum persicaria</u>	60	
88.7 90.8	<u>Polygonum persicaria</u>	100	
90.8 91.4	<u>Solidago tenunifolia</u>	50	
90.8 91.4	<u>Solidago puberula</u>	50	
91.4 98.3	Bare Ground		100
98.3 100.0	<u>Scirpus cyperinus</u>	100	
100.0 101.6	<u>Lactuca canadensis</u>	100	
101.6 104.0	Ditch (H ₂ O)		100
104.0 105.5	<u>Solidago tenunifolia</u>	100	
105.5 106.6	<u>Scirpus cyperinus</u>	100	

Table 2 (cont) Transect B : Species Intercept Cover (9/26/81)

From meter to meter:	Species:	% Cover:	% Bare Ground:
106.6 108.4	<u>Solidago puberula</u>	100	
108.4 108.9	<u>Solidago tenunifolia</u>	100	
109.9 112.0	<u>Scirpus cyperinus</u>	60	
109.9 112.0	<u>Solidago puberula</u>	40	
112.0 115.9	<u>Scirpus cyperinus</u>	20	
112.0 115.9	<u>Solidago tenunifolia</u>	80	
115.9 122.1	<u>Solidago puberula</u>	100	
122.1 123.5	<u>Scirpus cyperinus</u>	33	
122.1 123.5	<u>Solidago tenunifolia</u>	33	
122.1 123.5	<u>Solidago puberula</u>	33	
123.5 126.1	<u>Solidago puberula</u>	100	
126.1 136.1	<u>Scirpus cyperinus</u>	50	
126.1 136.1	<u>Solidago tenunifolia</u>	50	
136.1 138.2	<u>Scirpus cyperinus</u>	100	
138.2 141.4	<u>Solidago tenunifolia</u>	100	
141.4 147.0	Bare Ground		100
147.4 150.0	<u>Scirpus cyperinus</u>	50	
147.4 150.0	Bare Ground		50
150.0 152.5	Ditch (H ₂ O)		100
152.5 154.8	<u>Solidago puberula</u>	100	
154.8 157.8	Bare Ground		100
157.8 160.8	<u>Solidago puberula</u>	50	
157.8 160.8	<u>Scirpus cyperinus</u>	50	
160.8 165.0	<u>Scirpus cyperinus</u>	30	
160.8 165.0	<u>Solidago puberula</u>	70	
165.0 172.1	<u>Solidago puberula</u>	100	
172.1 173.5	<u>Aster novo-belgia</u>	50	
172.1 173.5	<u>Solidago puberula</u>	50	
173.5 175.3	<u>Solidago puberula</u>	100	
175.3 177.8	<u>Aster novo-belgia</u>	80	
175.3 177.8	<u>Solidago puberula</u>	20	
177.8 179.7	<u>Holcus lamatus</u>	100	
179.7 190.5	<u>Solidago puberula</u>	100	
190.5 194.6	<u>Holcus lamatus</u>	100	
194.6 195.8	<u>Solidago tenunifolia</u>	100	
195.8 198.1	<u>Holcus lamatus</u>	100	
198.1 199.5	<u>Solidago puberula</u>	100	
199.5 201.8	<u>Holcus lamatus</u>	100	
201.8 206.3	<u>Holcus lamatus</u>	50	
201.8 206.3	<u>Solidago puberula</u>	50	
206.3 208.3	<u>Solidago puberula</u>	100	
208.3 209.2	<u>Solidago tenunifolia</u>	100	
209.2 217.7	<u>Solidago puberula</u>	100	
217.7 225.7	<u>Solidago puberula</u>	50	
217.7 225.7	<u>Solidago tenunifolia</u>	50	
225.7 238.7	<u>Solidago puberula</u>	100	
238.7 239.5	<u>Holcus lamatus</u>	100	
239.5 250.0	<u>Solidago puberula</u>	100	

Table 3: Transect C : Species Intercept Cover (9/26/81)

From meter to meter:		Species:	% Cover:	% Bare Ground:
0.0	1.4	Bare Ground		100
1.4	5.7	<u>Ammophila breviligulata</u>	90	
1.4	5.7	<u>Rosa virginiana</u>	10	
5.7	19.4	<u>Solidago nemoralis</u>	85	
5.7	19.4	<u>Rosa virginiana</u>	15	
19.4	22.5	<u>Typha latifolia</u>	60	
19.4	22.5	<u>Solidago nemoralis</u>	20	
19.4	22.5	<u>Aster novo-belgii</u>	20	
22.5	33.0	<u>Typha latifolia</u>	55	
22.5	33.0	<u>Solidago nemoralis</u>	40	
22.5	33.0	<u>Aster novo-belgii</u>	5	
33.0	39.0	<u>Typha latifolia</u>	95	
33.0	39.0	<u>Aster novo-belgii</u>	5	
39.0	58.0	<u>Phragmites communis</u>	95	
58.0	68.0	<u>Typha latifolia</u>	80	
58.0	68.0	<u>Phragmites communis</u>	10	
68.0	73.0	<u>Typha latifolia</u>	90	
73.0	74.0	<u>Juncus, sp.</u>	80	
73.0	74.0	<u>Typha latifolia</u>	20	

Table 4: Transect D : Species Intercept Cover (9/26/81)

From meter to meter:		Species:	% Cover:	% Bare Ground:
0.0	2.0	Bare Ground		100
2.0	4.5	Grass, sp. #1	100	
4.5	5.6	Grass, sp. #1	50	
4.5	5.6	<u>Parthenocissus quinquefolia</u>	50	
5.6	5.8	Grass, sp. #1	100	
5.8	6.4	<u>Pinus rigida</u>	100	
6.4	7.5	Grass, sp. #1	100	
7.5	7.9	<u>Parthenocissus quinquefolia</u>	100	
7.9	9.3	Grass, sp. #1	100	
9.3	16.0	Grass, sp. #1	33	
9.3	16.0	<u>Populus tremuloides</u>	33	
9.3	16.0	<u>Rhus radicans</u>	33	
16.0	16.2	<u>Smilax rotundifolia</u>	100	
16.2	18.3	<u>Thelypteris palustris</u>	25	
16.2	18.3	<u>Solidago, sp.</u>	25	
16.2	18.3	<u>Rhus radicans</u>	50	
18.3	19.4	<u>Myrica pennsylvanica</u>	100	
19.4	20.1	Carex, sp.	100	
20.1	22.5	<u>Solidago, sp.</u>	50	
20.1	22.5	Carex, sp.	50	
22.5	26.0	<u>Solidago, sp.</u>	25	
22.5	26.0	<u>Spiraea tomentosa</u>	25	
22.5	26.0	<u>Phragmites communis</u>	50	
26.0	36.4	<u>Phragmites communis</u>	100	
36.4	39.4	<u>Scirpus americanus</u>	100	
39.4	40.4	<u>Scirpus americanus</u>	50	
39.4	40.4	<u>Spartina patens</u>	100	
40.4	43.4	<u>Spartina patens</u>	50	
40.4	43.4	<u>Spartina alterniflora</u>	50	
43.4	71.6	<u>Spartina alterniflora</u>	100	
71.6	73.0	Open water (brook)		100
73.0	103.6	<u>Spartina alterniflora</u>	100	
103.6		Open water (Herring River)		

Table 5: Transect E : Species Intercept Cover (9/26/81)

From meter to meter:	Species:	% Cover:	% Bare Ground:
0.0 4.0	Bare Ground		100
4.0 22.5	<u>Ammophila breviligulata</u>	100	
22.5 22.8	<u>Artemisia caudata</u>	100	
22.8 26.2	<u>Ammophila breviligulata</u>	100	
26.2 27.2	<u>Latharus japonica</u>	25	
26.2 27.2	<u>Solidago semper virens</u>	75	
27.2 28.1	<u>Ammophila breviligulata</u>	100	
28.1 30.0	(Trail)		100
30.0 30.6	<u>Solidago semper virens</u>	100	
30.6 31.9	<u>Andropogon scoparius</u>	100	
31.9 38.2	(Road)		100
38.2 40.6	<u>Spartina patens</u>	30	
40.6 50.0	(Road)		100
50.0 113.6	<u>Spartina patens</u>	100	
113.6 120.5	<u>Spartina patens</u>	50	
113.6 120.5	<u>Spartina alterniflora</u>	50	
120.5 123.1	<u>Spartina patens</u>	100	
123.1 150.0	<u>Spartina patens</u>	30	
123.1 150.0	<u>Spartina alterniflora</u>	70	
150.0 157.0	<u>Spartina alterniflora</u>	100	
157.0 161.5	<u>Spartina alterniflora</u>	50	
157.0 161.5	(Mud)		50
161.5 220.5	<u>Spartina alterniflora</u>	100	
220.5	Wellfleet Harbor	-	-

Table 6: Transect A: Species Occurrence and Cover (9/26/81)

Species: Adjusted Linear Distance: Relative Cover(%):

<u>Typha latifolia</u>	47.2	33.7
<u>Viburnum lentago</u>	19.3	13.8
<u>Spiraea latifolia</u>	18.0	12.9
<u>Solidago tenuifolia</u>	10.1	7.2
<u>Rubus allegheniensis</u>	8.8	6.3
<u>Rosa virginiana</u>	8.6	6.1
<u>Scirpus cyperinus</u>	4.6	3.3
<u>Solidago nemoralis</u>	3.5	3.5
<u>Polygonum scandens</u>	3.3	2.4
<u>Polygonum pennsylvanicum</u>	2.8	2.0
<u>Rubus hispidus</u>	2.7	1.9
<u>Dryopteris spinulosa</u>	1.8	1.3
<u>Thelypteris palustris</u>	1.6	1.1
<u>Lactuca canadensis</u>	1.4	1.0
<u>Panicum, sp.</u>	1.3	0.9
<u>Aster novi-belgii</u>	1.2	0.9
<u>Lythrum, sp.</u>	1.1	0.8
<u>Spiraea tomentosa</u>	0.6	0.4
<u>Sphagnum, sp.</u>	0.6	0.4
<u>Digitaria sanguinalis</u>	0.6	0.4
<u>Rhus radicans</u>	0.5	0.4
<u>Impatiens capensis</u>	0.1	0.1
<u>Grass (unknown)</u>	0.1	0.1
<u>Polygonella articulata</u>	0.1	0.1
<u>Lechea maritima</u>	0.1	0.1
TOTAL	139.9	

Table 7: Transect B: Species Occurrence and Cover (9/26/81)

Species:	Adjusted Linear Distance:	Relative Cover(%):
Solidago puberula	75.1	35.4
Lactuca canadensis	37.0	17.4
Solidago tennuifolia	23.4	11.0
Scirpus cyperinus	17.3	8.2
Holcus lanatus	13.6	6.4
Rubus allegheniensis	13.5	6.4
Spiraea tomentosa	8.5	4.0
Polygonum persicaria	5.4	2.5
Spiraea latifolia	4.0	1.9
Aster novo-belgii	3.5	1.6
Rhus radicans	2.9	1.4
Rubus hispidus	1.9	0.9
Myrica pennsylvanica	1.8	0.8
Gaylussacia baccata	1.8	0.8
Ammophila breviligulata	1.7	0.8
Rosa virginiana	0.8	0.4
TOTAL	212.2	
Water	2.4	
Bare Ground	10.2	

Table 8: Transect C: Species Occurrence and Cover (9/26/81)

Species: Adjusted Linear Distance: Relative Cover(%):

Typha latifolia	26.0	37.3
Phragmites communis	19.1	27.4
Solidago nemoralis	16.5	23.7
Ammophila breviligulata	3.9	5.6
Rosa virginiana	2.5	3.6
Aster novo-belgii	0.9	1.3
Juncus, sp.	0.8	1.1

TOTAL 69.7

Bare Ground 3.3

Table 9: Transect D: Species Occurrence and Cover (9/26/81)

Species:	Adjusted Linear Distance:	Relative Cover(%):
<i>Spartina alterniflora</i>	60.3	59.8
<i>Phragmites communis</i>	12.2	12.1
Grass, sp. #1	8.0	7.9
<i>Scirpus americanus</i>	3.5	3.5
<i>Rhus radicans</i>	3.3	3.3
<i>Solidago</i> , sp.	2.6	2.6
<i>Spartina patens</i>	2.5	2.5
<i>Carex</i> , sp.	1.9	1.9
<i>Myrica pennsylvanica</i>	1.1	1.1
<i>Populus tremuloides</i>	2.2	2.2
<i>Parthenocissus quinquefolia</i>	1.0	1.0
<i>Spiraea tomentosa</i>	0.9	0.9
<i>Pinus rigida</i>	0.6	0.6
<i>Thelypteris palustris</i>	0.5	0.5
<i>Smilax rotundifolia</i>	0.2	0.2
TOTAL	100.8	
Bare Ground	2.0	
Water	2.4	

Table 10: Transect E : Species Occurrence and Cover (9/26/81)

Species:	Adjusted Linear Distance:	Relative Cover(%):
Spartina alterniflora	90.5	46.4
Spartina patens	78.4	40.2
Ammophila breviligulata	22.8	11.7
Solidago semper virens	1.4	0.7
Andropogon scoparius	1.3	0.7
Artemisia caudata	0.3	0.1
Lathyrus japonica	<u>0.2</u>	<u>0.1</u>
TOTAL	194.9	
Bare Ground	25.6	